PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Develop Wheels, Pools and Falls Approach for Fish Passage at Dams.

BPA project number: 20110
Contract renewal date (mm/yyyy): ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Sun Mountain Reflections

Business acronym (if appropriate) SMR

Proposal contact person or principal investigator:

Name	Faith E. Ruffing
Mailing Address	1907 N E 75th Avenue
City, ST Zip	Portland, OR 97213
Phone	(5030 256-8748
Fax	(503) 257-4926
Email address	fruffing@gte.net

NPPC Program Measure Number(s) which this project addresses
5.1-5.7,6.1, 10, 12

FWS/NMFS Biological Opinion Number(s) which this project addresses
10,11,15,18,

Other planning document references
Wy-Kan-Ush-Mi Wa Kish Wit, Multi Species Framework

Short description
Conduct an Environmental Science Analysis using the Wheels, Pools, and Falls approach to transform the dam spillways into a series of pools and falls designed for continuous safe passage in water deemed safe by water quality standards for all aquatics. .

Target species
Anadromous fish

Section 2. Sorting and evaluation

Subbasin
Systemwide

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more	If your project fits either of these	Mark one or more categories

caucus	processes, mark one or both	
☒ Anadromous fish ☐ Resident fish ☐ Wildlife	☐ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☒ Research & monitoring ☐ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Natural Environment Conditions Analysis	a	Study the natural aquatic environment to determine the dimensions of the river structures
		b	Conduct field research
		c	Analyze the dynamics of the water flowing through the river structures
		d	Review and analyze water quality data
2	WPF Environmental Science Analysis	a	Compare the structure of the dams with the natural river structure
		b	Analyze data collected by the regional entities to test the scientific theories

		c	Develop environmental designs for the hydropower projects
		d	Apply structural engineering principles to the environmental designs
		e	Test or model the new modifications
3	Cost Benefit Analysis	a	Describe operational opportunities resulting from the modifications
		b	Identify mitigation measures and costs
		c	Develop a budget for the next 20 years
		d	Develop a diverse source funding strategy
4	Peer Review and Evaluation	a	Subcontract with CRITFC and other Tribal organizations to provide insight and support for the analysis.
		b	Establish a panel of specialists
		c	Meet with CRITFC and Agency specialists
5	Write WPF Environmental Science Analysis	a	Prepare Preliminary Draft
		b	Prepare Draft
		c	Prepare Final

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2000			20.00%
2	10/1999	9/2000			20.00%
3	10/1999	9/2000			20.00%
4	10/1999	9/2000			20.00%
5	10/1999	9/2000			20.00%
				Total	100.00%

Schedule constraints

Completion date
9/2000

Section 5. Budget

FY99 project budget (BPA obligated):

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel	Faith E. Ruffing	%37	72,800
Fringe benefits		%5	10,400
Supplies, materials, non-expendable property		%1	1,500
Operations & maintenance		%0	
Capital acquisitions or improvements (e.g. land,		%0	

buildings, major equip.)			
NEPA costs		%0	
Construction-related support		%0	
PIT tags	# of tags:	%0	
Travel		%1	2,500
Indirect costs		%6	11,370
Subcontractor	CRITFC	%25	50,000
Other	Agency Specialists Panel	%25	50,000
TOTAL BPA FY2000 BUDGET REQUEST			$198,570

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		%0	
		%0	
		%0	
		%0	0
Total project cost (including BPA portion)			$198,570

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	$198,570	$200,000	$200,000	

Section 6. References

Watershed?	Reference
☐	1 NWPPC. 1997. Columbia River Basin Fish and Wildlife Program. NWPPC. Portland, Oregon
☐	2 NMFS 1995 Biological Opinion. NMFS. Portland, Oregon
☐	3 EPA 1991 Water Quality Criteria. EPA Washington, D.C.
☐	4 Ruffing, F.E. 1996 Total Dissolved Gas Fixed Monitoring Program for John Day, The Dalles, and Bonneville Projects. Annual Activities Report to the North Pacific Division WY 1996. USACE Portland, Oregon
☐	5 Ruffing, F.E. 1997. Dissolved Gas Compliance Program for John Day, The Dalles, and Bonneville Projects. Annual Activities Report to the North Pacific Division WY 1997. Prepared for the USACE by Sun Mountains Reflections. Portland, Oregon
☐	6 Ruffing, F.E . 1996 Wheels, Pools and Falls: A proposed new approach to abating TDG supersaturation in waters below Corps projects in the Columbia, Willamette and Rogue River Basins. USACE NWP Portland, Oregon
☐	7 Ruffing, F.E. 1998 Wheels, Pools and Falls. A concept paper for Multi-Species Recovery. Columbia River Multi-Species Framework Program. NWPPC. Portland, Oregon
☐	8 Rainey, S. 1998. Letter expressing concerns for fish safety. NMFS. Portland, Oregon
☐	9 Ruffing, F.E. 1998. Wheels, Pools and Falls pool size and number analysis. Sun Mountain Reflections. Portland, Oregon
☐	10 Ruffing. F.E. 1998. Wheels, Pools and Falls Report. Sun Mountain Reflections. Portland, Oregon
☐	11 USACE. 1991. Fisheries Handbook of Engineering Requirements and Biological Criteria. Fish Passage Development and Evaluation Program. North Pacific Division.

	Portland, Oregon
☐	12 USACE. 1990. Engineering Manual EM 1110-2-1603. Engineering and Design. Hydraulic Design of Spillways. CECW-EH-D. Portland, Oregon
☐	13 Jansen, R.E. 1988 Editor. Advanced Dam Engineering for Design Construction and Rehabilitation. Van Nostrand Reinhold.
☐	14 Nez Perce, Umatilla, Warm Springs and Yakima Tribes. 1996. The Columbia River Anadromous Fish Restoration Plan, Wy-Kan-Ush-Mi Wa-Kish-Wit. CRITFC Portland, Oregon

PART II - NARRATIVE

Section 7. Abstract

This solicitation is a request to fund an Environmental Science Analysis using a new approach, Wheels, Pools and Falls (WPF), to modification of the hydroelectric projects. WPF addresses the fish passage and water quality problems associated with the dams identified in the Fish and Wildlife Program, the NMFS Biological Opinion, the Wy-Kan-Ush-Mi Wa-Kish-Wit and the Multi-Species Framework.

Analysis of natural pools and falls environments will be used to determine appropriate ranges of dimensions to provide safe passage and meet water quality and quantity requirements. This information will be used to develop environmental conceptual designs for the eight Lower Snake and Columbia River Dams. Biological and engineering principles will be applied to the environmental designs to assure that they meet biological and engineering standards. A Cost/ Benefit Analysis will be done and a Research Plan and a Plan of Action will be developed.

The Analysis will take up to three years to complete. The first year will test and confirm the feasibility of the WPF concept along ecological, engineering and budget constraints. The second and third years will depend on the findings of the first and will address issues raised and detail the Plan of Action. Implementation of the WPF Plan of Action is expected to take up to 20 years. SMR will draw on CRITFC and Agency Specialists for advice, review, evaluation and information for the Analysis.

Section 8. Project description

a. Technical and/or scientific background

Back ground, history, location of problem

Hydroelectric projects in the Columbia River are estimated to have caused a decline in annual adult runs from 10 to 16 million before the dams to 2.5 million now. Passage mortality is estimated to be 15 to 30 percent for downstream migrants per dam and 5 to 10 percent for upstream migrants per dam. Passage has enormous effects on upriver runs.

Cumulative juvenile passage mortality for fish migrating downstream past nine dams in the Snake and Columbia Rivers is estimated to be 77 percent to 96 depending on the volume and timing of stream flows. Cumulative adult passage mortality for these nine dams is 37 to 61 percent.

Losses due to hydropower is estimated to be 5-11 million of the 7 to 14 million adult fish decline. Of 8 million fish lost, 4 million are due to loss of habitat and 4 to hydropower passage mortality. (Reference 1 NWPPC Fish and Wildlife Program, Section 4)

Safe passage over the dams is a necessary ingredient for the restoration of the fishery in the Pacific Northwest. Safe passage means movement in water with a range of velocities that is not detrimental to the fish and a balance between pools and fast moving water with transition zones that reduce shear impacts and increases the susceptibility to predation. At present the downstream migration is provided passage past the dams by way of the powerhouse, over the spillway, surface collection, barging, and the navigation locks. Upstream migration is provided by fish ladders. Recently the National Marine Fisheries Service requested that spill be provided continuously at some projects to improve fish passage of smolts. The amount of spill requested for salmon recovery results in violation of water quality criteria to levels deemed to be unsafe for aquatic life. (Reference 2 NMFS BIOP and 3 EPA WQ Criteria)

Water quality deterioration is determined by failure to meet water quality standards. The Environmental Protection Agency (EPA) establishes water quality criteria at levels that have been determined safe for aquatic life. Total Dissolved Gas Supersaturation (TDGS) and Temperature are two water quality parameter excesses identified in the Columbia River considered detrimental to fish and other aquatic organisms. (Reference 1) TDGS is directly related to the release of water through the spillway of the dams. This supersaturation continues at levels above the standard from one dam to the next for the peak aquatic growth period in spring and summer. (Reference 4 and 5 Ruffing TDG Reports for the USACE Portland District) Pooling of the water upstream of the dams slows the water increasing the temperature.

Clearly Hydroelectric projects are a major detriment to the recovery of fish throughout the Columbia Basin. Hydroelectric projects also provide a broad spectrum of economic benefits to the region. The basic premise of the Wheels, Pools and Falls Concept is to develop solutions to the Ecological problems of the dams while maintaining the Economic benefits they provide. The purpose of the Wheels, Pools and Falls concept is to provide an innovative approach that will guide the discussion to the mitigation of the impacts of the dams without eliminating them. (Reference 6 WPF Approach and 7 Framework Concept paper)

History of Wheels, Pools and Falls

Wheels, Pools and Falls is a new innovative approach to reduce the impacts of the hydroelectric projects in the Columbia Basin on the health of the aquatic ecosystem without eliminating the dams. The name is symbolic of the vision with “Wheels” standing for the economic benefits of the projects and “Pools and Falls” representative of the natural aquatic structure of the project modifications. The economic benefits are flood control, energy, navigation, agriculture, recreation, community development, trade and the fishery.

Wheels, Pools and Falls is an environmental science approach that combines the ecological and the economical goals to achieve an environmental whole greater than the parts by devising solutions that enhance the benefits of both and diminish the constraints between them.

Wheels, Pools and Falls is a new concept developed by the author as a means to address total dissolved gas water quality standards violations below Corps projects in the Lower Columbia and Snake Rivers. This work, started in 1995, has progressed to a much broader purpose to include continuous safe passage for migration juveniles and adults.

The overall challenge from the beginning was to develop a concept that resulted in restoring the fish and keeping the dams. It was obvious from the regional discussion that the public was not ready to give up the dams to save the fish. In addition, the cost of the solution had to be comparable to conventional solutions under consideration. Finally, the

effort of restoring the salmon had to be viewed by the public as an economic benefit to all rather than an ecological cost benefiting a few.

This new approach to solving TDGS problems was presented to Corps management in 1996 and processed through its Quality Improvement Program emerging with the recommendation that the concept had merit and should be pursued. When the author completed her appointment with the Corps in 1997, no action had been taken by the Corps and the author has continued to move the concept forward under the auspices of her firm, Sun Mountain Reflections.

This concept has been presented to and discussed with representatives of regional entities, staff of the CRITFC, private parties and staff of some members of the Congressional Delegation. It has received favorable comment and encouragement to move it forward.

Major concerns expressed by NMFS and the USACE regarding the WPF were the size and number of pools needed to dissipate the energy and reduce the turbulence to a tolerable level, and the ability of the WPF to accommodate discharges of the volume observed at the projects.

The following equation was used calculate the dimensions of pools needed to dissipate the energy of the discharge to a level deemed safe for smolt and adult migration by the NMFS.

$$\text{Volume of Pool} = \frac{\text{volume of discharge x energy of inflow x density of water}}{\text{Turbulence factor}}$$

The turbulence factor is 30 for smolts and 8 for adults. (Reference 8 NMFS).

Using this equation a conceptual environmental design was developed for The Dalles dam which meets the turbulence requirement of the above equation for both smolts and adults and accommodates spillway discharges from 7.5 to 375 kcfs. The design allows for continuous flows and falls low enough for upstream migrants to navigate. The number of pools is limited to five. The pools and falls structure is contained within the present stilling basin and tailrace. The details of the calculations and the design are discussed in the WPF pool size and number Analysis and in the WPF Report. (Reference 9,10)

The next steps in the analysis are to compare the design to natural systems and to apply engineering principles to the conceptual designs to assure that structural engineering standards are met. These principles are described in engineering manuals such as the USACE Fisheries Handbook of Engineering Requirements (11) and Biological Criteria and Engineering on the Hydraulic Design of Spillways(12), Advance Dam Engineering by Jansen (13).

Research projects

The WPF Analysis will address the following scientific theories.

1 Reduction in the energy of the head and the amount of exposure of the fall will reduce the concentration of TDG in water released from dams.

2 The height of the falls and the low head energy required to meet TDG standards will be similar to those determined safe for juvenile and adult fish passage at the dams.

3 Modification of the spillways to provide safe and continuous passage through pools and falls meeting environmental constraints can be designed to meet hydrologic and structural engineering requirements.

4 Continuous safe passage through the dams in flow of sufficient quantity and quality will help restore aquatic populations.

5 Replacement of the present spillway designs with pools and falls of the proper dimensions will increase the fish passage efficiency at the dams and provide water within the water quality standards.

Critical uncertainties

Natural Environmental Conditions Analysis.

- What are the dimensions of the pools and falls found in nature that are safe for passage?
- What is the water quality associated with these natural formations?
- What are the river dynamics of flow, velocity, head, turbulence and other parameters that are safe for fish and meet water quality standards?

Project Engineering Analysis

- What structural dimensions of the dams are outside the range of safe dimensions in the natural system?
- What are the dimensions of the pools needed to reduce turbulence to a level deemed safe for fish?
- What are the optimal heights of the falls for safe passage?
- What contribution does the energy in the head, the amount of exposure to the atmosphere in the fall and the depth of the plunge make to the concentration of total dissolved gas in water released over the spillway?

- What are the hydrological variations in volume and velocity of discharge that need to be accommodated at each project?

- What are the structural engineering requirements to meet engineering standards?

b. Rationale and significance to Regional Programs

Overall objective of the recovery plans cited in section 1 is to restore populations of aquatic life to the Columbia basin. Fish passage impediments and water quality deterioration associated with the dams in the Snake and Columbia Rivers will be addressed in this solicitation. The Fish and Wildlife Program objectives to improve juvenile Salmon migration by improving Columbia and Snake River flow and velocity with the Wheels, Pools and Falls concept by providing a means for continuous release over the spillway that respond to the natural fluctuations in flow.

The Wheels, Pools and Falls will improve Columbia and Snake River Salmon passage at the dams by providing a passage environment that mimics the dimensions of the natural conditions in the river. Natural pools and falls are usually a diverse array of sizes and shapes and heights. It is the diversity that allows for different pathways under different flow volumes and velocity. It is the diversity of the river structure that allows for a range of flows and velocities providing eddies and backwashes and quiet areas above the falls. Wheels, Pools and Falls will provide this diversity. Fish migrating down will be able to take advantage of the range of velocities to select from to get themselves downstream instead of waiting for the spillways to be open. Fish migrating upstream will have not have to face a hundred foot barrier but instead will find falls of a height readily jumped alternating with pools providing quiet areas before encountering the next fall. The adults will not be limited to the narrow confines of the fish ways but could have the entire length of the spillway for upstream migration.

The volume of water over the spillway will not be limited by total dissolved gas supersaturation as gas concentration will be kept within the water quality criteria through the design of the pools and falls and not the volume of water released. The volume of spill can be adjusted to meet fish passage requirements instead of water quality standards. Fish migrating in water that meets water quality standards will be healthier and more able to avoid predation and compete throughout the life cycle.

Water quality improvements in TDGS will benefit all aquatic organisms including the resident fish populations.

Wheels, Pools and Falls environmental designs for fish passage and water quality improvements can be incorporated into other dams in the basin and future hydroelectric development.

Wheels, Pools and Falls designs could be considered in the discussion of the Snake River draw down, the John Day draw down or removal and surface collection and transportation aspects of the NMFS Biologcal Opinion..

Wheels, Pools and Falls partially addresses the goals and principles of the Tribal Fish Restoration Plan, Wy-Kan-Ush-Mi Wa-Kish-Wit.(14) by reducing the major impacts to the salmon by the dams: fish passage impediments and water quality deterioration

The economic and ecological balance required in the Multi-Species Framework is addressed in the Wheels, Pools and Falls by developing a concept that resolves the fish passage and water quality problems associated with the dams without losing dams and the economic benefiits they provide.

The cost/ benefit analysis will include consideration of mitigation actions and costs.

c. Relationships to other projects

Work funded under the FWP in recent years and the majority of the ongoing work is focused on short term solutions for fish recovery in the areas of fish passage and water quality in response to the ESA listing of recent years. At this time the effort is beginning to focus the long term solutions. It is important that comprehensive solutions be developed that are truly long term and long sighted. A fix that works once and for all. Wheels, Pools and Falls responds to the long term solution requirements of the FWP.

Wheels, Pools and Falls is new concept and is submitted for consideration with the group of innovative projects being considered for funding. As such is it not really related to other projects funded under the FWP. Information and reports developed as part of other projects will be used in the analysis.

The Analysis will provide information on the design of pools and falls in the natural system which are safe for fish passage and which are barriers to fish passage and to verify the condition of the water quality. This information can be used to analyze different aspects of the structural engineering designs of hydroelectric projects to see which meet the requirements described in the natural system analysis. This information will used in designing the pools and falls for each project. This information may be useful in other projects funded through the FWP.

The Wheels, Pools and Falls concept has developed through a collaborative effort initially with Corps staff and members of the interagency Dissolved Gas Team while the author was appointed to the water quality section of the Portland District of the Corps, and later through a group of professional contacts. The Wheels, Pools and Falls concept was presented to these individuals and a dialogue was established to discuss the merits and concerns of the agency specialists. These contacts have been generous with their time and information but there is a limit to how much time can be contributed to this endeavor without some budgetary considerations.

The Environmental Science Analysis includes areas of scientific and engineering beyond the expertise of the author. It is the intention of this solicitation that Sun Mountain Reflections will conduct and write the analysis in cooperation with other experts in the region. SMR will call on CRITFC to provide fishery and natural environment advice and

a panel of agency specialists from NMFS, ACE, BoR, USFWS and other agencies for fishery and engineering support. Most of the information to be used for this analysis has been collected and stored by various agencies. An example is the total dissolved gas data collected in the region that is stored in a large database. In order to access this data and information some staff time will be needed and some provision must be made for these efforts.

To that end the author has asked CRITFC to subcontract with SMR on this solicitation to provide advice, guidance and field support and $50,000 has been requested to cover these expenses.

Some agency personnel have indicated a willingness to provide information and engineering support and participate in the engineering analysis and $50,000 has been requested to cover these costs although no specific amount has been assigned to any agency. The specific agency amounts will be determined at the time the contracts are finalized after the proposal has been funded.

d. Project history (for ongoing projects)

new proposal

e. Proposal objectives

Objective 1 Conduct a Natural Environment Analysis

1. Study the natural aquatic environment to determine the dimensions of the river structures - pools, falls, rapids, and habitat- that proved to be safe for fish passage as demonstrated by the existence of healthy productive populations.

2. Conduct field research at select project and natural river locations.

3. Analyze the dynamics of the water flowing through the river structures and the ranges of the flow, velocity, head, turbulence and other parameters that would have occurred under the natural environmental fluctuations.

4. Review and analyze water quality data to calculate ranges of temperature and dissolved gas supersaturation that would have occurred as a result of the flow dynamics experienced for the given natural structures.

Objective 2 Wheels, Pools and Falls Environmental Design Aanlysis

1 Compare the structure of the dams with the natural river structure dimensions to see what dimensions of the dams are outside of the ranges of the natural river structures.

2 Analyze data collected by the regional entities to test the scientific theories, resolve uncertainties, and describe new areas of research needed to address questions arising from the analysis.

3 Develop environmental designs for the hydropower projects that incorporate the river structure dimensions into the structure of the dams so that the fish can pass in safety with

sufficient quantity and quality of flow to ensure a healthy and productive environment for all aquatic life.

4 Apply structural engineering principles to the environmental designs to assure compliance with engineering standards.

5 Test or model the new modifications against the environmental fluctuations expected in 10 year, 20 year, 50 year and 100 year cycles to ensure that they meet hydrologic requirements.

Objective 3 Cost Benefit Analysis

1 Describe operational opportunities resulting from the modifications that assure all benefits of the projects are maximized to the extent possible.
2 Identify mitigation measures and costs.
3 Develop a budget for the next 20 years describing the construction schedule and what could be accomplished for 1 billion, 2 billion or 3 billion dollars.
4 Suggest a diverse source funding strategy that allows participation and investment by regional stakeholders including public agencies, the Tribes, commercial interests and the public at large.

Objective 4 Peer Review and Evaluation

1 Subcontract with CRITFC and other Tribal organizations to provide insight and support for the analysis.
2 Establish a panel of specialists from the CRITFC, NMFS, USFWS,USACE, BOR Basin PUD"S and other entities to assist in identifying pertinent reports, data, and other information and to provide guidance for the analysis.
3 Meet with CRITFC and Agency Specialists quarterly to review progress.

Objective 5 Write Wheels, Pools and Falls Environmental Science Analysis

1 Prepare Preliminary Draft
2 Prepare Draft
3 Prepare Final

f. Methods

The Wheels Pools and Falls Environmental Science Analysis is a three-year project. The first year is a reconnaissance level analysis, with most of the effort dedicated to literature review, data analysis, identification and development of methodologies to answer the critical uncertainties and test the scientific and engineering theories. The reconnaissance level has to be sufficient to do preliminary analysis of the costs of the WPF and to determine the extent of feasibility of the concept. Flexibility in the methodology is provided in the number of field studies conducted, the level of detail the natural conditions, environmental designs, and cost benefit analysis.

Objective 1 Conduct a Natural Environment Analysis

A. October
Meet with CRITFC and Agency Specialist Panel to finalize the major elements of the analysis.

B. October – December
Compile and review available literature, maps, photographs and other historical and scientific data to identify locations of falls in the basin where fish are able to pass and falls that are barriers to passage.

C October to December
Select a number of representative locations for field studies prioritized according to the amount of available information such as previous work, available water quality and bathymetric data, association with pools and rapids and accessibility.

D December to February
Develop a list of data parameters to be measured, develop data sheets and field study protocols and schedule. List should include photography, TDGS, temperature, dissolved oxygen, flow, velocity and dimensions of the falls and surrounding pools and rapids.

E March to September
Conduct Field Studies, analyze data, write field reports. Identify appropriate sites fish for studies in the following years.

F October to September
Write Environmental Conditions Analysis for incorporation into the Environmental Science Analysis

Objective 2 Wheels, Pools and Falls Environmental Designs Analysis.

A October
Meet with CRITFC and Agency Specialist Panel to finalize the major elements of the analysis.

B October to December
Compile and review available literature, maps, photographs and other historical and engineering data on the dams to identify different river morphology, spillway designs, gate designs that provide different head energy, fall heights, fish by pass systems.

C December to February
Analyze data on TDGS relative to the design of the dams. Identify critical uncertainties that cannot be resolved without additional field studies. Develop field study protocols and schedules to collect the data.

D March to September
Conduct Field Studies, analyze data, write field reports. Identify appropriate sites fish for studies in the following years.

E January to September
Develop the WPF environmental conceptual designs incorporating information from 1B and 2B using the pool size dimensions required for historic ranges of discharges for the dam as a starting point. Incorporate safe dimensions for fish into the designs from developing information.

F October to September
Work with CRITFC and Agency Specialists to identify biological and engineering concerns of the designs and principles that need to be tested further. These could include flow, velocity, dimensions, water quality, hydrological, geotechnical and structural engineering uncertainties. This information will be used to develop the scope of work for the next years.

G October to September
Write the Wheels, Pools and Falls Environmental Designs Analysis for incorporation into the WPF Environmental Science Aanlysis.

Objective 3 Cost Benefit Analysis

A October
Meet with CRITFC and Agency Specialist Panel to finalize the major elements of the analysis.

B October to September
Develop a Table of Cost and Benefits comparing the WPF to other options and economic benefits based on preliminary cost estimates developed from the WPF designs.

C October to September
Write a brief cost benefit analysis based on the information in the table for inclusion in the WPF Environmental Science Analysis.

Objective 4 Peer Review and Evaluation, and
Objective 5 Write WPF Environmental Science Analysis Report

A October, December, March, June, and September
Meet with CRITFC and Agency Specialist Panel to finalize the major elements of the WPF Environmental Science Analysis, and review the Preliminary Draft, the Draft, and the Final analysis and to monitor and evaluate progress of the Project.

B October to September
Meet with CRITFC and Agency Specialist Panel as needed to provide insight, advice, technical and field support where necessary to keep the project on schedule and budget.

g. Facilities and equipment

SMR Computer, Vehicle for field research
CRITFC staff time, field equipment
Agencies staff time for informtion exchange, meetings etc.

h. Budget

The budget request is for full time involvment for the Principle Investigator for this solicitation for one year. The hourly rate is $35, the fringe benefits is 12.5 % and the indirect costs is 15% of the hourly rate for a total personnel cost of about $45.

The $50,000 for the CRITFC staff and the $50,000 for the Agency Specialist Panel are not to exceed estimates.

Section 9. Key personnel

SMR
Faith E. Ruffing, Principle Investigator 1 FTE

Education
BA Biology Case Western University, 1970, MA Biology Portand State University 1977. Completion of all graduate requirements toward Doctorate in Envionmental Science and Applied Research except dissertation. Portland State University 1983. Curtailment due to lack of funds.

Employment 1961-Present
Case Western Reserve, Northwestern and University of Chicago, Oregon State Department of Environmental Quality, City of Portland Bureau of Water Works and the US Army Corps of Engineers. Ms Ruffing established her firm, Sun Mountian Reflections, in 1984 and has provided environmental sceince and consulting services to US Department of Agriculture, the City of Portland, the Stae of Oregon Parks Department, and the US Army Corps of Engineers to the present.

Recent work related to the WPF solicitation.

- Developing and coordinating Total Dissolved Gas Fixed Monitoring Program for Portland District Projects in the Lower Columbia River. Developing plans of action, schedule and budget following direction from the Northwest Division office. Developing scopes of work for contractors and managing contracts.

- Developing a Database for total dissolved gas programs for incorporation into the District water quality database. Reviewing data and assembling it into display format for reports and meetings.

- Writing reports of findings of the District Dissolved Gas Compliance Program, Total Dissolved Gas Fixed Monitoring Program, and the Total Dissolved Gas section of the District Water Quality Annual Report.

- Representing the section at intra and inter agency meetings. Attending and representing the District at NMFS/ EPA Dissolved Gas Team meetings. Serving on production and review teams as necessary.

- Developing and coordinating the Dissolved Gas Compliance Program for the USACE Portland District Projects in the Lower Columbia, Willamette and Rogue River Basins. Developing and implementing plans of study, schedules and budgets for gas saturation analysis. Organizing and conducting field studies and writing reports of findings and recommendations.

- Developing the Wheels, Pools and Falls concept after reviewing fish passage, water quality and engineering documents and particpating in the regional discussion regarding salmon recovery and the importance of dam modification toward that effort. Moving the concept forward through discussions with regional entities and Tribal staff. Responding to concerns raised by the Corps and NMFS. Submitting the WPF concept into the NWPPC Multi-Species Framework Program.

Publications

Ms Ruffing is member of the Tranboundary Gas Group an international group representing the regional entities and tribes developiung a basinwide plan of action for TDGS abatement. Ms Ruffing serves as tri-chair of the physical monitoring and research committee and will introduce the WPF for inclusion in the plan of action.

Ruffing, F.E . 1996 Wheels, Pools and Falls: A proposed new approach to abating TDG supersaturation in waters below Corps projects in the Columbia, Willamette and Rogue River Basins. USACE NWP Portland, Oregon

Ruffing, F.E. 1998. Wheels, Pools and Falls pool size and number analysis. Sun Mountain Reflections. Portland, Oregon

Ruffing, F.E. 1998 Wheels, Pools and Falls. A concept paper for Multi-Species Recovery. Columbia River Multi-Species Framework Program. NWPPC. Portland, Oregon

Ruffing, F.E. 1997. Dissolved Gas Compliance Program for John Day, The Dalles, and Bonneville Projects. Annual Activities Report to the North Pacific Division WY 1997. Prepared for the USACE by Sun Mountains Reflections. Portland, Oregon

Ruffing, F.E. 1996 Total Dissolved Gas Fixed Monitoring Program for John Day, The Dalles, and Bonneville Projects. Annual Activities Report to the North Pacific Division WY 1996. USACE Portland, Oregon

CRITFC to be determined
Agencies to be determined

Section 10. Information/technology transfer

Written documents described can be provided in electronic form for distribution. At least 10 hard copies will be providied to the CRITFC and Agency Specialists for review and comment. The data will be stored in the database determined to be the most approprite. The WPF Analysis will be published for distribution according to details of the final contract.

Congratulations!